What is claimed is:

1. A high-speed, broadband, wireline modem including an adaptive equalizer having both a training mode and a decision-directed, non-training mode, the adaptive equalizer comprising:

at least one of: a forward path coupled to receive the signal samples, the forward path including a forward filter and a decision element, and a feedback path coupled between an output of the decision element and an input of the decision element, the feedback path including a feedback filter; and

means for adapting the one of said forward filter and said feedback filter based on a least squares error criterion, as distinguished from a least mean squares error criterion.

2. The apparatus of Claim 1, further comprising a memory for storing received signal samples.

3. The apparatus of Claim 1, comprising both said feedforward path and said feedback path.

4. The method of Claim 1, wherein the means for adapting operates during decision-directed mode.

5. The method of Claim 1, wherein the combined length of the forward filter and the feedback filter is moderate relative to adaptation processing power.

6. The method of Claim 1, wherein adaptation is performed using fixed-point arithmetic.

7. The method of Claim 1, wherein said means for adapting performs substantially the following computation:

$$e_p = e(1 - K^{T_{fast}} X_{fast}).$$

8. The method of Claim 1, wherein said means for adapting performs substantially the following computations:

$$F_{fast} = \lambda_i F_{fast},$$

$$c_n = F_{fast} \frac{e_p}{1 + e^T F_{fast} e_p},$$

$$F_{fast} = F_{fast} - c_n e^T F_{fast},$$

$$b_n = K_{fast} + A_{fast} c_n.$$

9. The method of Claim 1, wherein said means for adapting performs substantially the following computations:

$$K_{fast} = (m - (D_{fast}\mu))/(1 - \eta^T\mu),$$

$$D_{fast} = D_{fast} - K_{fast}\eta^T.$$

10. The method of Claim 1, wherein a routine for updating said one of said forward filter and said feedback filter performs no more than 22N multiplies, where N is the number of filter taps, and wherein no distinct stabilization quantity is computed.

11. A method of performing adaptation of an adaptive filter using an LS-type adaptation algorithm, comprising:

storing a first block of data;

initializing the adaptation algorithm;

processing the first block of data using the adaptation algorithm;

storing a second block of data; and

re-initializing the adaptation algorithm using results from processing the first block of data.

12. The method of Claim 11, wherein the adaptive filter is used in a communication system in which symbols are communicated, one symbol per symbol period, further comprising:

starting and finishing processing of a block of data within a portion of a single symbol period, a remaining portion of the symbol period being used for other computations.

13. The method of Claim 12, further comprising selectably fixing said remaining portion by fixing a size for the data blocks.

14. A method of modem training in which the modem includes multiple subsystems provided with respective adaptive filters, comprising:

partially training the adaptive filter of a first subsystem by applying a first training algorithm to first data to obtain first filter settings;

at least partially training the adaptive filter of a second subsystem; and

completing training of the adaptive filter of the first subsystem by using for initialization at least some of said first filter settings and applying the first training algorithm to second data not contiguous with said first data in a received data stream.